Living with the Stars

Shawn Domagal-Goldman

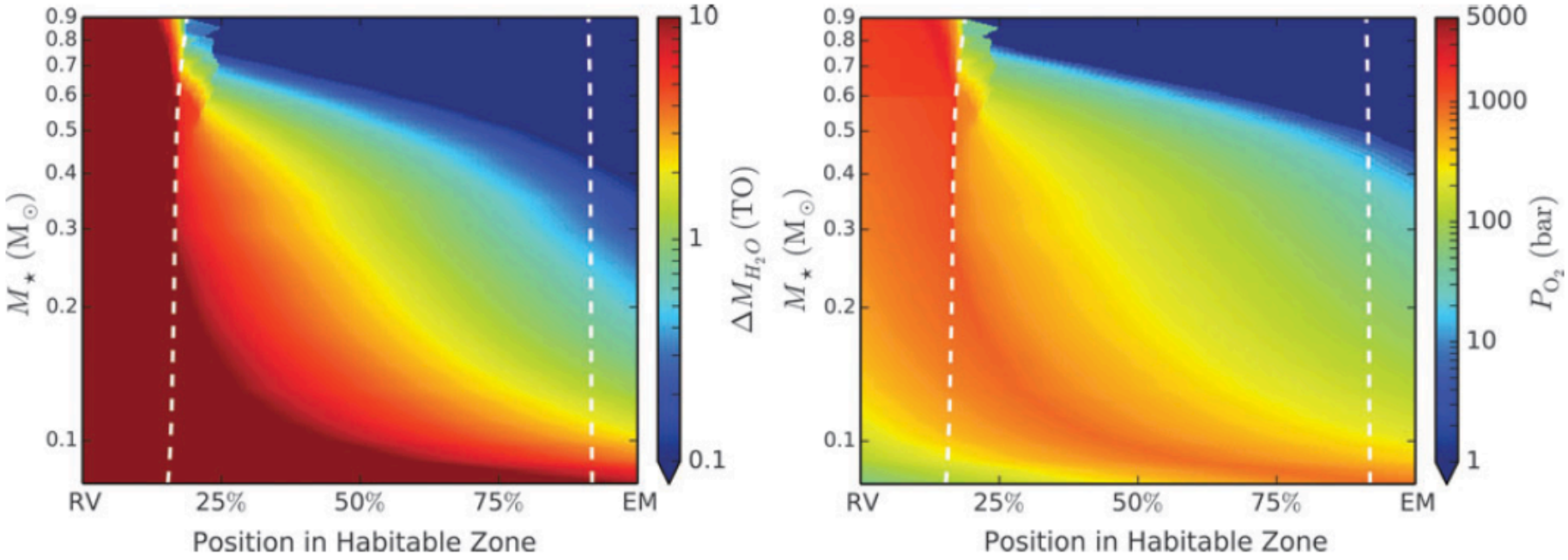
NASA GSFC

Virtual Planet Laboratory, Exoplanet Climate Group

Pressing (Exo)planetary habitability questions

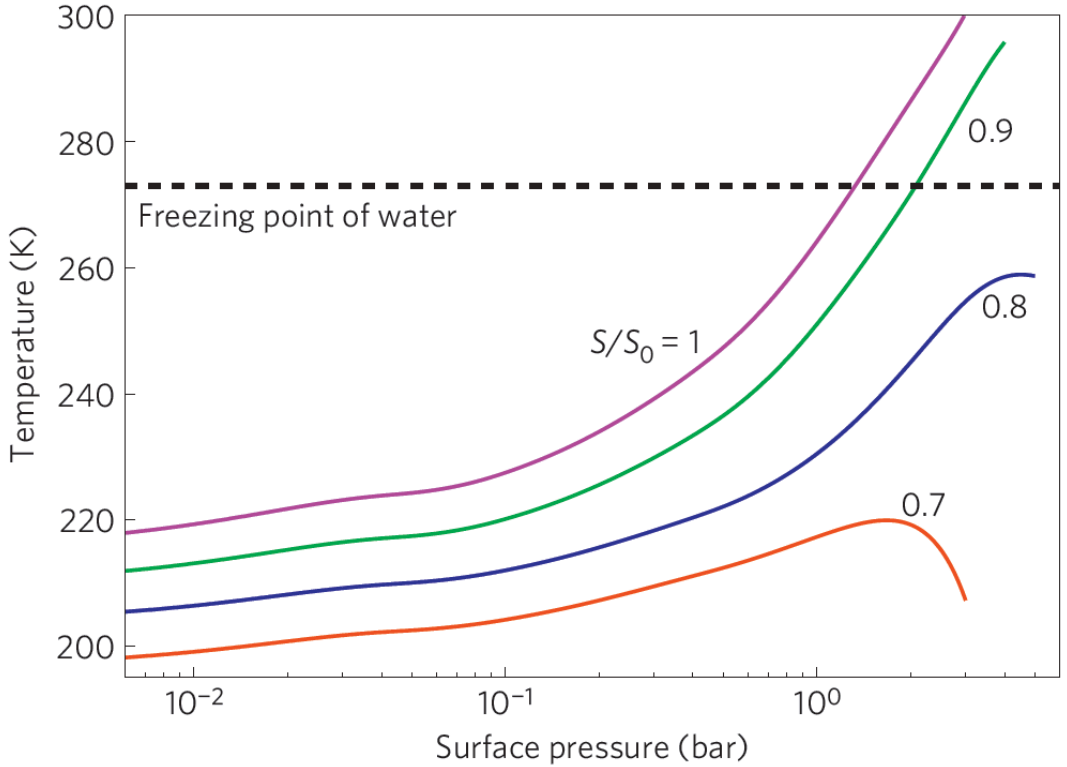
- What controls the habitability of exoplanets?
- What is the history of the habitability of Mars?
- What caused the rise of atmospheric O_2 on Earth?

What controls the habitability of exoplanets?



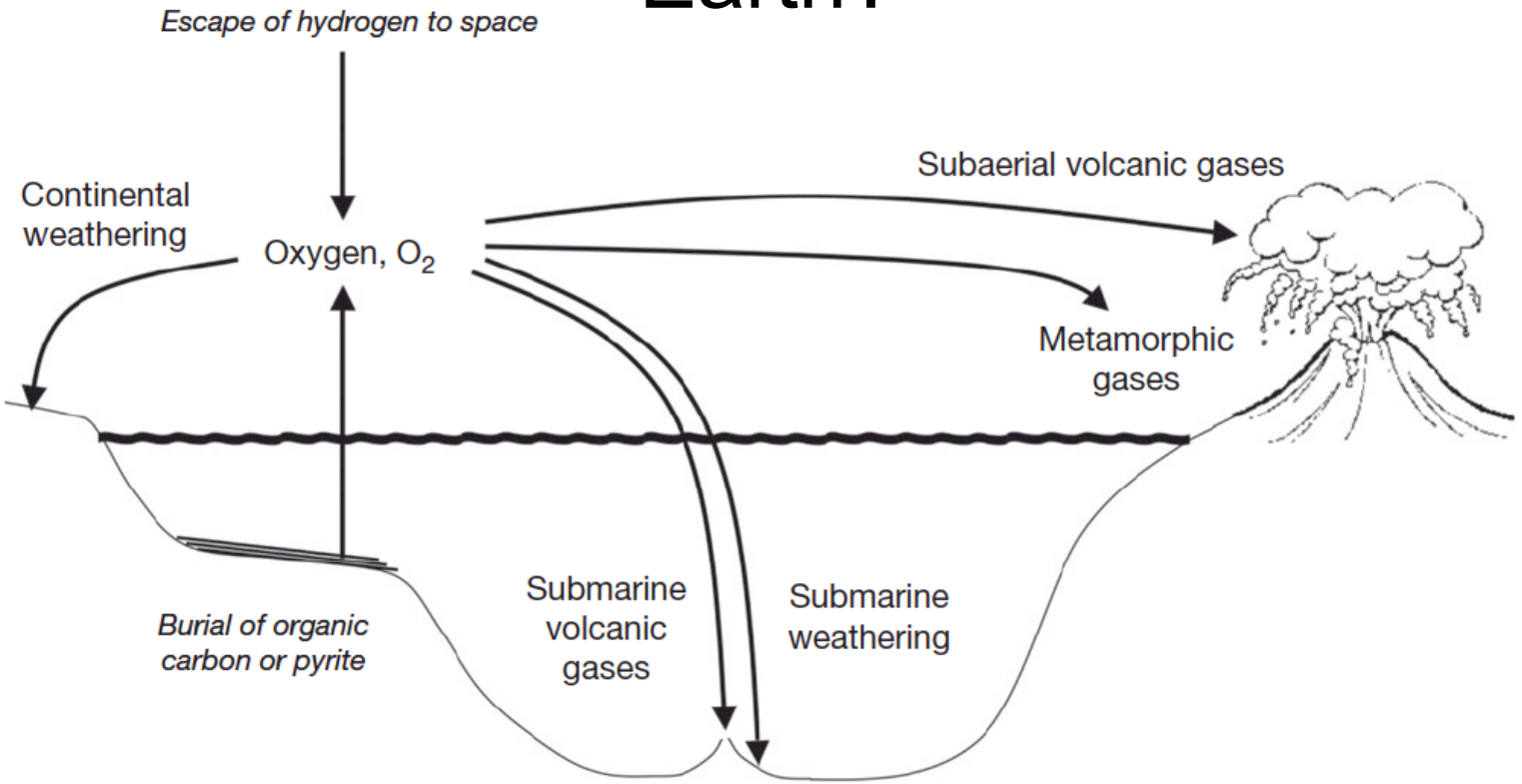
Luger and Barnes, 2015

What is the history of the habitability of Mars?



Ramirez et al., 2013

What caused the rise of atmospheric O_2 on Earth?



Pressing (Exo)planetary habitability questions

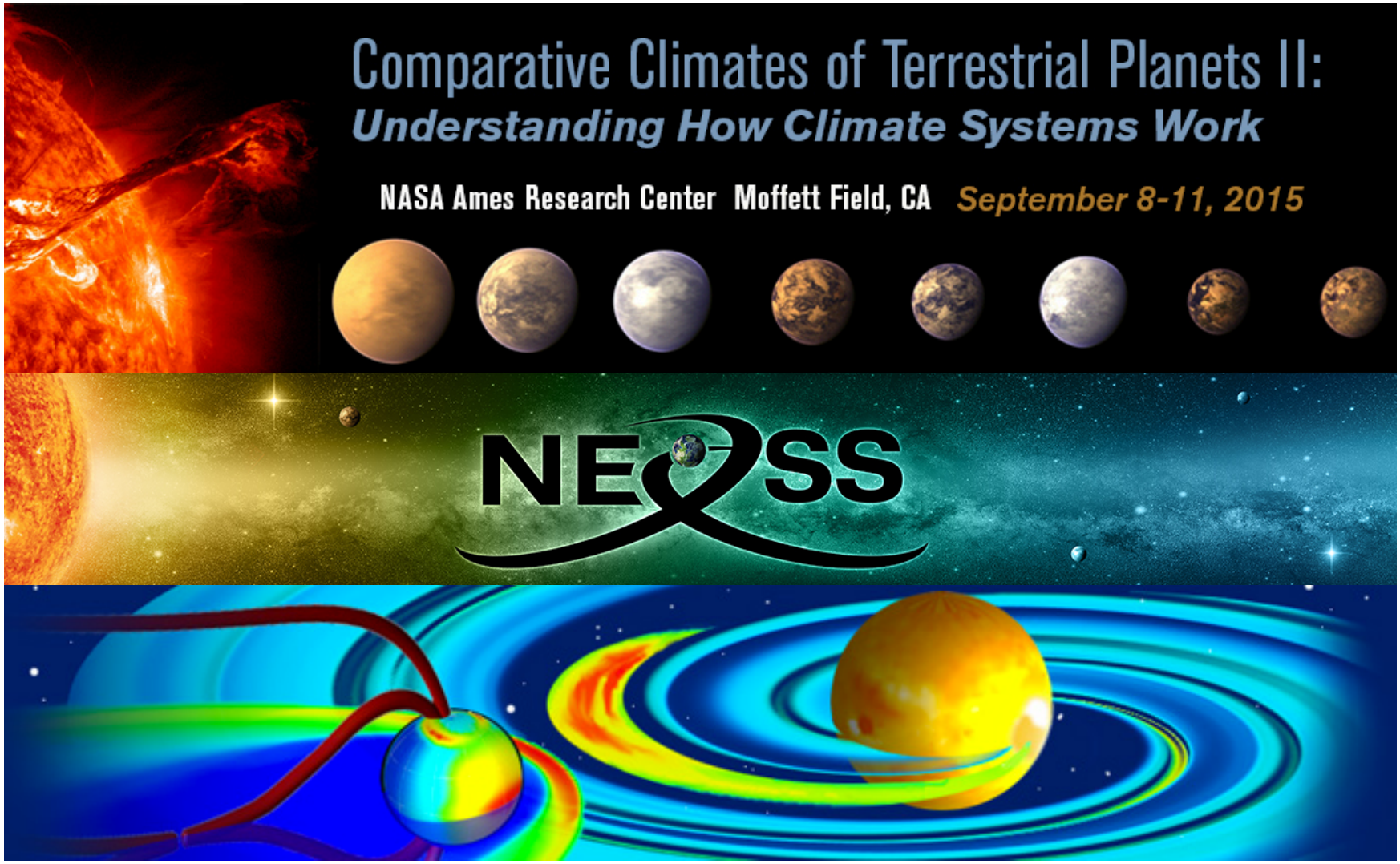
- What controls the habitability of exoplanets?
- What is the history of the habitability of Mars?
- What caused the rise of atmospheric O_2 on Earth?

Pressing (Exo)planetary habitability questions

- What controls the habitability of exoplanets?
  In part, atmospheric escape!
- What is the history of the habitability of Mars?
  In part, atmospheric escape!
- What caused the rise of atmospheric O_2 on Earth?
  In part, atmospheric escape!

What about atmospheric chemistry?

- Escape (again) can cause elemental fractionation and changes to bulk planet chemistry
- Photolysis is the engine for atmospheric chemistry
- Ion-driven chemistry is generally understudied (with exceptions)


Comparative Climates of Terrestrial Planets II:
Understanding How Climate Systems Work
NASA Ames Research Center Moffett Field, CA September 8-11, 2015
NExSS